

## 1 CLAIMS

We claim:

1. A system for using outside ventilation air to maintain indoor comfort and air quality,  
comprising an air delivery means, damper means, sensor means, and control means, wherein:

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said air delivery means supplies outside air to a building interior regulated by said control means for the purpose of providing ventilation cooling;

said damper means directs airflow from said air delivery means using a first and second position, wherein said damper first position causes said air delivery means to recirculate indoor air, and said damper second position causes said air delivery means to supply outside air to indoor spaces and to release a similar volume of indoor air to outdoors;

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said sensor means includes an indoor sensor and an outdoor sensor, both for measuring air temperature;

said control means includes a single user interface and a controller;

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said user interface and said controller connected by a communication means;

said user interface includes buttons for establishing control settings;

said user interface allows the user to establish preferred minimum and maximum indoor temperature settings;

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said controller includes a microprocessor programmed with algorithms for predicting outdoor and indoor temperatures from temperature data obtained from said indoor and outdoor temperature sensors and from said minimum and maximum temperature settings;

said controller conveying said predictions to said user interface where they are graphically displayed and from which a user of said system can select settings that maintain a desired comfort level and minimize needs for cooling of the building interior using vapor compression-based air conditioning;

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said algorithms calculate a ventilation limit temperature which is greater than or equal to said minimum temperature setting and which increases with decreasing building cooling requirements to prevent over-cooling;

- 1 said control means initiates said ventilation cooling operation by activating said air delivery means and by changing position of said damper means to said second position when the temperature sensed by said indoor sensor exceeds the temperature sensed by said outdoor sensor by a predetermined magnitude, and terminates said ventilation cooling operation when the
- 5 temperature sensed by said indoor sensor falls below said ventilation limit temperature;
2. The system of claim 1, wherein said user interface can display a predicted range of indoor air temperatures using a bar graph or other graphical representation;
3. The system of claim 1, wherein said user interface can display a message to indicate whether control settings will result in air conditioner operation;
4. The system of claim 1, wherein said user interface updates said button descriptions and functions according to previous pressings of said buttons;
- 10 5. The system of claim 1, wherein "help" instructions are provided for the function of said buttons;
6. The system of claim 1, further comprising a communications network connection by means of which weather predictions can be obtained by said control for use by control algorithms and/or display purposes;
7. The system of claim 1, wherein said air delivery means and said damper means can be operated at the command of the user to either re-circulate indoor air or supply outside air;
- 15 8. The system of claim 1, wherein said air delivery means includes a variable speed fan motor;
9. The system of claim 8, wherein the ventilation cooling airflow rate varies proportionally with cooling demand;
10. The system of claim 1 wherein outside air is cooled by an evaporative cooler to improve ventilation cooling capacity;
11. The system of claim 1, wherein said user interface can display a graphical representation of energy costs and/or savings associated with the users choice of control settings;
- 20 12. The system of claim 1, wherein said air delivery means includes a furnace or heating coil for supplying warm air;
13. The system of claim 12, wherein said controller controls said variable speed fan motor to vary the rate of warm air delivery proportional with heating demand;
14. The system of claim 1, wherein said control, said air delivery means, and said damper means cause a specified volume of outside air to be delivered to a building interior to maintain indoor air quality;
- 25 15. The system of claim 12, wherein heating temperature settings for four time periods can be graphically displayed so that all settings can be visualized at once, and wherein separate heating schedules can be applied for weekday and weekend periods;
16. The system of claim 1, further comprising a compressor-based air conditioner condensing unit and evaporator coil;

- 1 17. The system of claim 1, wherein a control selection can provide automatic operation of heating, ventilation cooling, or air conditioning as needed during unoccupied or vacation periods to maintain indoor temperatures between specified upper and lower indoor temperature limits that are set by the user;
18. The system of claim 1, wherein the user can temporarily modify heating or air conditioning temperature settings and can set the duration that said settings are in effect;
- 5 19. The system of claim 8, wherein individual maximum fan speeds for ventilation cooling, air conditioning, heating, and manual fan operation can be set using said user interface;
20. The system of claim 16, wherein said controller operates said compressor-based air conditioning to lower indoor temperatures during morning hours in order to avert on-peak air conditioning energy use;
21. The system of claim 16, wherein air conditioner operation can be curtailed during user-specified peak electricity demand periods set using said user interface;
- 10 22. The system of claim 1, further comprising a communications network connection to electric service providers;
23. The system of claim 22, wherein said electric service provider can remotely curtail air conditioner operation;
24. The system of claim 22, wherein the current cost of electricity is communicated to allow display of real-time prices and/or projections of daily energy costs.

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